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| <b>(54) Title:</b> OIL PRODUCT AND MANUFACTURING PROCESS   |           |  |
| <b>(57) Abstract</b><br><br>A method of producing an edible oil product is described. The method comprising the steps of spray crystallising a hard oil and mixing the spray crystallised oil with a soft oil. A product by such method is also described.   |           |  |

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## OIL PRODUCT AND MANUFACTURING PROCESS

The present invention relates to an oil product and a method of manufacturing an oil product.

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Soft oils or liquid oils, that is oils which generally are in a liquid state but may be in a solid state at room temperature are relatively unstable and in general do not give the desired consistency to an end food product in a number of areas such as in coatings, baking, frying or other cooking methods. Nevertheless liquid oils are convenient to use since for example they can be poured.

On the other hand, hard or hardened oils, that is oils which are in a solid state at room temperature, typically with slip points from say 30 to 60°C, are relatively stable to rancidity but either have to be delivered hot by a tanker, melted from a block or flaked or powdered to become a liquid by melting. Thus, such oils are considerably less convenient to use but give a better mouth feel and texture to the end food product, for example in the above-mentioned areas.

The present invention has been made from a consideration of the disadvantages with known hard and soft oils and in order to provide an improved oil product and process for manufacturing thereof which overcomes one or more of the disadvantages with known hard and soft oils.

According to a first aspect of the present invention there is provided a method of producing an oil product comprising the steps of spray crystallising a hard oil and mixing the spray crystallised oil with a soft oil. It has been found

that the resultant product comprises a liquid emulsion which has the advantages of a liquid but which has properties, such as cooking, coating ability similar to a hard oil.

5

By hard oil is meant an edible oil with a slip point of between 30-90°C, more preferably, 30-60°C, most preferably 35-60°C. Preferably, hardened oils provide the hard oils. A hardened oil is formed by taking a non hardened oil,  
10 which may or may not be a liquid at room temperature, and carrying out catalytic reduction, preferably by bubbling hydrogen through the oil in it's liquid state using a catalyst eg. Nickel. The result is that the oil becomes less poly-unsaturated and more saturated as the unstable  
15 double bonds are replaced by carbon to hydrogen bonds. This results in the oil becoming much more stable to oxidation and provides an oil with a higher slip point. Oils can be hardened to a particular slip point eg palm oil can be hardened to 40/42, 48/50, 52/54°C slip point. Fully  
20 hardened palm stearine can have a slip point of 56/60° C. Hardened coconut oil is traditionally 32/34°C.

Typical hardened oils in accordance with the invention include:-

25 rape, soya, sunflower, coconut, palm, palm.  
Kernel, peanut, olive, tallow, fish and cotton seed.

Typical non hardened oils which may be utilised as the soft oil include:-

30 rape, soya, palm, palm  
Kernel, coconut, sunflower, peanut, olive, shea nut

Tallow, lard, butter, butter oil, pumpkin seed, sesame seed, grape seed, safflower, evening primrose, wheatgerm, flaxseed, cottonseed, ricebran, hazlenut, walnut, almond, macademia, cashew, pecan, brazil.

5

Preferably, the hard oil/soft oil mixture comprises less than 60% hard oil, more preferably less than 50% hard oil, most preferably less than 30% hard oil.

10 Preferably, the hard oil/soft oil mixture comprises more than 40% soft oil, more preferably, more than 50% soft oil, most preferably, more than 70% soft oil.

Advantageously, there may be more than 45% hard oil whilst  
15 still maintaining some mobility.

The invention makes the melting process easier and faster but provides an oil with a much enhanced stability when compared with a liquid non hardened oil. This is due in  
20 part to the reduction in slip point and the mixing of the spray crystallised powder with the liquid oil. The equivalent hardened or partially hardened oil would be in block form and would take longer to melt. Melting of a block requires the energy needed to liquify some of the oil  
25 first and this liquified oil then assists with melting the rest of the solid fraction. The invention is already partially in liquid form so the heat transfer is considerably quicker and the melting subsequently more rapid. The invention will be of benefit where rapid  
30 melting is important eg. restaurants, take away food shops such as fish and chip shops, tailor made bakery fats, industrial mixing/melting in heating tanks or by direct addition to a hot mix, coating products such as

meat/poultry with fat without melting the fat first or using a liquid oil is also envisaged. When this product is subsequently cooked the mixture will melt and will cook/taste like a harder oil. The spray crystallised powder fraction could also have encapsulated within it a flavour or colour which would not be released to any great extent without the whole mixture being subject to heat.

According to a second aspect of the invention there is provided a method of producing an oil product comprising the steps of mixing a soft oil in liquid form with a hard oil in powdered form and spray crystallising the mixture.

The invention further includes an oil product produced according to a method of the invention.

The method may include heating and subsequently cooling the resultant oil product.

In use, when an oil product of the invention is heated during normal use, for example during cooking and subsequently allowed to cool, the effect is similar to that achieved using a conventional hard oil.

Thus, the invention allows for spray cooled or spray crystallised fat/oil powder with and without other additives, e.g. emulsifiers being suspended in an oil which is liquid in room temperature in a number of ratios of powder to liquid fat/oil.

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The invention has the advantages of providing:

1. A free flowing suspension at room temperature which when heated above the hard oil or powdered fat component's melting point becomes a homogenous mixture, which will solidify when allowed to cool.

5

2. More stable fat/oil mixes can be supplied in liquid form and mixed or coated on to products without any additional heat. The heat necessary to melt the fat fraction coming from either the subsequent cooking process or the temperature of the hot product being coated.

10

3. This suspension can be used for frying purposes as it is free flowing and will become a homogenous mixture in the frying process very quickly and behave thereafter as a much harder oil.

15

Spray crystallisation is a known technique and is described in patent no. EP 393963 and co-pending application no. PCT/GB/ 97/02655 which are incorporated herein by reference.

20

The steps of atomising and rapidly cooling in any of the methods described are preferably performed by conventional spray crystallisation techniques. A typical apparatus and method for performing spray crystallisation is described in EP 0393963 and the contents of that document are incorporated herein by reference. In particular, the atomisation may be by spraying and by means of an atomising nozzle through which liquid under pressure is pumped. The rate of spraying and size of the spray ejection apertures on the nozzle may be controlled or selected as desired to suit the particular requirements, for example depending on

25

30

the nature of the liquid or mixture to be sprayed. The rapid cooling may be by means of directing one or more jets of cryogenic liquid, such as liquid nitrogen, oxygen, air or carbon dioxide, onto or towards the atomised spray. The size and arrangement of such jets may be controlled or selected as desired to suit the particular requirements and may be as described in EP 0393963. The methods may be controlled or automated to achieve the desired results.

#### 10 Examples:-

Hardened palm oil (slip point 48-50°C) was spray crystallised and then mixed with non hardened liquid rapeseed oil in various percentages. Mobility checks were carried out at intervals.

|    | <u>%HPO</u> | <u>%RSO</u> | <u>Mobile RT</u> | <u>After 3 days</u> | <u>After 6 days</u> |
|----|-------------|-------------|------------------|---------------------|---------------------|
|    | 20          | 80          | Yes              | Yes                 | Yes *               |
| 20 | 25          | 75          | Yes              | Yes                 | Yes                 |
|    | 28          | 72          | Yes              | Yes                 | Yes                 |
|    | 30          | 70          | Yes              | Yes                 | Set                 |
|    | 33          | 67          | Yes              | Yes                 | Set                 |
|    | 35          | 65          | Yes              | Yes                 | Set                 |
| 25 | 40          | 60          | Yes              | Set                 |                     |
|    | 50          | 50          | Yes              | Set                 |                     |

\* Stays mobile at room temperature and in either 5°C or 18°C.

30

For comparison, the whole mixtures of spray crystallised powders/liquid oil and ordinary solid oil/liquid oil were



heated and then cooled to room temperature and their slip points measured as follows.

|    | <u>%HPO</u> | <u>%RSO</u> | <u>Slip Point (°C)</u> |
|----|-------------|-------------|------------------------|
| 5  |             |             |                        |
|    | 45SC        | 55          | 41-43                  |
|    | 30SC        | 70          | 39-41                  |
|    | 15SC        | 85          | Not solid at - 18°C    |
|    | 45          | 55          | 48-49                  |
| 10 | 30          | 70          | 44-45                  |
|    | 15          | 85          | Not solid at - 18°C    |

where SC represents spray crystallised versions.

15 The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and  
20 documents are incorporated herein by reference.

All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so  
25 disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

Each feature disclosed in this specification (including any  
30 accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each

feature disclosed is one example only of a generic series of equivalent or similar features.

5 The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so  
10 disclosed.

## CLAIMS

1. A method of producing an edible oil product comprising the steps of spray crystallising a hard oil and mixing the spray crystallised oil with a soft oil.
- 5 2. A method according to claim 1, wherein the resultant product comprises a liquid emulsion.
3. A method according to claim 1 or 2, wherein the hard oil has a slip point of between 30-90°C.
4. A method according to claim 1, 2 or 3, wherein  
10 hardened oils provide the hard oils.
5. A method according to claim 4, wherein the hardened oil is selected from one or more of rape, soya, sunflower, coconut, palm, palm, kernel, peanut, olive, tallow, fish and cotton seed.
- 15 6. A method according to any preceding claim, wherein the soft oil is selected from rape, soya, palm, palm, kernel, coconut, sunflower, peanut, olive, shea nut, tallow, lard, butter, butter oil, pumpkin seed, sesame seed, grape seed, safflower, evening primrose,  
20 wheatgerm, flaxseed, cottonseed, ricebran, hazlenut, walnut, almond, macademia, cashew, pecan, brazil.
7. A method according to any preceding claim, wherein the hard oil/soft oil mixture comprises less than 60% hard oil.
- 25 8. A method according to any preceding claim, wherein the hard oil/soft oil mixture comprises more than 40% soft oil.
9. A method according to any of claims 1-8, wherein the method includes heating and subsequently cooling the  
30 resultant oil product.
10. An edible oil product produced in accordance with any of claims 1-9.

11. An edible oil product comprising a spray crystallised hard oil mixed with a soft oil.
12. A product according to claim 11, which comprises the two components as a liquid emulsion.
- 5 13. A product according to any of claim 11 or 12, wherein the hard oil has a slip point of between 30-90°C.
14. A product according to any of claims 11-13, wherein a hardened oil provides a hard oil.
15. A product according to claim 14, wherein the hardened  
10 oil is formed by taking a non hardened oil, which may or may not be a liquid at room temperature, and carrying out catalytic reduction.
16. A product according to claim 14 or 15, wherein the hard oil has been hardened to a particular slip point.
- 15 17. A product according to any of claim 11-16, wherein the hard oil is a hardened oil selected from one or more of rape, soya, sunflower, coconut, palm, palm, kernel, peanut, olive, tallow, fish and cotton seed.
18. A product according to any of claims 11-17, wherein  
20 the soft oil is a non hardened oil selected from one or more of rape, soya, palm, palm, kernel, coconut, sunflower, peanut, olive, shea nut, tallow, lard, butter, butter oil, pumpkin seed, sesame seed, grape seed, safflower, evening primrose, wheatgerm,  
25 flaxseed, cottonseed, ricebran, hazlenut, walnut, almond, macademia, cashew, pecan, brazil.
19. A product according to any of claims 11-18, wherein the hard oil/soft oil mixture comprises less than 60% hard oil.
- 30 20. A product according to any of claims 11-19, wherein the hard oil/soft oil mixture comprises more than 40% soft oil.

21. A product according to any of claims 11-20, wherein the product has been subject to heating and subsequently cooling the resultant oil product.
22. A method as hereinbefore described with reference to  
5 the examples.
23. A product as hereinbefore described with reference to the examples.

# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/GB 99/02570

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 C11B1/00 A23D9/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 C11B A23D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No. |
|------------|---|-----------------------|
| X          | US 4 889 740 A (PRICE JUDITH E)<br>26 December 1989 (1989-12-26)<br>column 3, line 15-19<br>column 3, line 36-39<br>column 3, line 54-60<br>column 4, line 22,23<br>column 5, line 60-64<br>column 6, line 6-22 | 1-23                  |
| A          | EP 0 393 963 A (CANADIAN OXYGEN CO LTD)<br>24 October 1990 (1990-10-24)<br>cited in the application<br>Whole document   | 1-23                  |

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Information on patent family members

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| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
|---|---------------------|----------------------------|---------------------|
| US 4889740 A                              | 26-12-1989          | CA 1339500 A               | 21-10-1997          |
|   |                     | DE 3816978 A               | 08-12-1988          |
|   |                     | GB 2208079 A,B             | 22-02-1989          |
|   |                     | JP 1055146 A               | 02-03-1989          |
|   |                     | JP 2686279 B               | 08-12-1997          |
| EP 0393963 A                              | 24-10-1990          | US 4952224 A               | 28-08-1990          |
|   |                     | AU 628507 B                | 17-09-1992          |
|   |                     | AU 5253990 A               | 18-10-1990          |
|   |                     | CA 1328571 A               | 19-04-1994          |
|   |                     | DE 69019874 D              | 13-07-1995          |
|   |                     | DE 69019874 T              | 12-10-1995          |
|   |                     | JP 2293038 A               | 04-12-1990          |
|   |                     | NZ 233284 A                | 28-04-1992          |